

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the present application:

Claims 1-8 (Cancelled).

9. (Currently Amended) A process for producing an unsaturated carboxylic acid, which comprises subjecting an alkane or a mixture of an alkane and an alkene to a vapor phase catalytic partial oxidation reaction in the presence of a catalyst produced by the a process according to claim 1 comprising:

a) providing a catalyst having a surface and comprising a mixed metal oxide having a base composition empirical formula $A_aD_bE_cX_dO_e$,

wherein A is at least one element selected from the group consisting of Mo and W, D is at least one element selected from the group consisting of V and Ce, E is at least one element selected from the group consisting of Te, Sb and Se, and X is at least one element selected from the group consisting of Nb, Ta, Ti, Al, Zr, Cr, Mn, Fe, Ru, Co, Rh, Ni, Pt, Sb, Bi, B, In, As, Ge, Sn, Li, Na, K, Rb, Cs, Fr, Be, Mg, Ca, Sr, Ba, Ra, Hf, Ag, Pb, P, Pm, Eu, Gd, Dy, Ho, Er, Tm, Yb and Lu; and, when $a = 1$, $b = 0.01$ to 1.0 , $c = 0.01$ to 1.0 , $d = 0.01$ to 1.0 , and e is dependent on the oxidation state of said other elements; and

b) vapor depositing at least one dopant metal onto said surface of said catalyst whereby the performance of said catalyst is improved.

10. (Currently Amended) A process for producing an unsaturated nitrile, which comprises subjecting an alkane, or a mixture of an alkane and an alkene, and ammonia to a vapor phase catalytic oxidation reaction in the presence of a catalyst produced by the a process according to claim 1 comprising:

a) providing a catalyst having a surface and comprising a mixed metal oxide having a base composition empirical formula $A_aD_bE_cX_dO_e$,

wherein A is at least one element selected from the group consisting of Mo and W, D is at least one element selected from the group consisting of V and Ce, E is at least one element selected from the group consisting of Te, Sb and Se, and X is at least one element selected from the group consisting of Nb, Ta, Ti, Al, Zr, Cr, Mn, Fe, Ru, Co, Rh, Ni, Pt, Sb, Bi, B, In, As, Ge, Sn, Li, Na, K, Rb, Cs, Fr, Be, Mg, Ca, Sr, Ba, Ra, Hf, Ag, Pb, P, Pm, Eu, Gd, Dy, Ho, Er, Tm, Yb and Lu; and, when $a = 1$, $b = 0.01$ to 1.0 , $c = 0.01$ to 1.0 , $d = 0.01$ to 1.0 , and e is dependent on the oxidation state of said other elements; and

b) vapor depositing at least one dopant metal onto said surface of said catalyst whereby the performance of said catalyst is improved.

11. (Currently Amended) A process for preparing a catalyst, comprising:

a) vapor depositing one upon the other a plurality of thin films, each thin film containing at least one of the elements A, D, E and X to form a composite of A, D, E and X, wherein A is at least one element selected from the group consisting of Mo and W, D is at least one element selected from the group consisting of V and Ce, E is at least one element selected from the group consisting of Te, Sb and Se, and X is at least one element selected from the group consisting of Nb, Ta, Ti, Al, Zr, Cr, Mn, Fe, Ru, Co, Rh, Ni, Pt, Sb, Bi, B, In, As, Ge, Sn, Li, Na, K, Rb, Cs, Fr, Be, Mg, Ca, Sr, Ba, Ra, Hf, Ag, Pb, P, Pm, Eu, Gd, Dy, Ho, Er, Tm, Yb and Lu; and

b) calcining said plurality of thin films to form a catalyst comprising a mixed metal oxide having a base composition empirical formula $A_aD_bE_cX_dO_e$ wherein A, D, E and X are as previously defined, O is oxygen and, when $a = 1$, $b = 0.01$ to 1.0 , $c = 0.01$ to 1.0 , $d = 0.01$ to 1.0 , and e is dependent on the oxidation state of said other elements.

12. (Original) The process according to claim 11, wherein said vapor deposition is accomplished by chemical vapor deposition.

13. (Original) The process according to claim 11, wherein said vapor deposition is accomplished by physical vapor deposition.

14. (Original) A process for preparing a catalyst, comprising:

vapor depositing, one upon the other, a plurality of thin films, each thin film containing at least one of the elements Mo, V, Nb and X, to form a composite of Mo, V, Nb and X, where X is at least one element selected from the group consisting of Ta, Ti, Al, Zr, Cr, Mn, Fe, Ru, Co, Rh, Ni, Pt, B, In, Ce, As, Ge, Sn, Li, Na, K, Rb, Cs, Fr, Be, Mg, Ca, Sr, Ba, Hf, Pb, P, Pm, Eu, Gd, Dy, Ho, Er, Tm, Yb, Lu, Au, Ag, Re, Pr, Zn, Ga, Pd, Ir, Nd, Y, Sm, Tb, Cu and Sc; and

calcining said composite to form a catalyst. .

15. (Currently Amended) A process for preparing a catalyst, comprising the steps of:

vapor depositing, one upon the other, a plurality of thin films, each thin film containing at least one of the elements Mo, V, Te and X¹, to form a composite of Mo, V, Te and X¹, where X¹ is at ~~least~~ least one ~~element~~ element selected from the group consisting of Sc, Y, La, Re, Ir, Cu, Ag, Au, Zn, Ga, Si, Ge, As, Pb, S, Se, Sn and Bi; and

calcining said composite to form a catalyst.

16. (New) The process for producing an unsaturated carboxylic acid according to Claim 9, wherein said vapor depositing of said dopant metal is done by sputter doping with at least one dopant selected from the group consisting of Pd, Au, Pd-Au alloys, Ga, Cu, Ag, Ni, Zn, Pr, Re, Ir, Nd, Y, Sm, Tb, In, Bi and Se.

17. (New) A process for producing an unsaturated nitrile, wherein said vapor depositing of said dopant metal is done by sputter doping with at least one dopant selected from the group consisting of Pd, Au, Pd-Au alloys, Ga, Cu, Ag, Ni, Zn, Pr, Re, Ir, Nd, Y, Sm, Tb, In, Bi and Se.

18. (New) A process for producing an unsaturated carboxylic acid, which comprises subjecting an alkane or a mixture of an alkane and an alkene to a vapor phase catalytic partial oxidation reaction in the presence of a catalyst produced by a process comprising:

a) vapor depositing one upon the other a plurality of thin films, each thin film containing at least one of the elements A, D, E and X to form a composite of A, D, E and X, wherein A is at least one element selected from the group consisting of Mo and W, D is at least one element selected from the group consisting of V and Ce, E is at least one element selected from the group consisting of Te, Sb and Se, and X is at least one element selected from the group consisting of Nb, Ta, Ti, Al, Zr, Cr, Mn, Fe, Ru, Co, Rh, Ni, Pt, Sb, Bi, B, In, As, Ge, Sn, Li, Na, K, Rb, Cs, Fr, Be, Mg, Ca, Sr, Ba, Ra, Hf, Ag, Pb, P, Pm, Eu, Gd, Dy, Ho, Er, Tm, Yb and Lu; and

b) calcining said plurality of thin films to form a catalyst comprising a mixed metal oxide having a base composition empirical formula $A_aD_bE_cX_dO_e$ wherein A, D, E and X are as previously defined, O is oxygen and, when $a = 1$, $b = 0.01$ to 1.0 , $c = 0.01$ to 1.0 , $d = 0.01$ to 1.0 , and e is dependent on the oxidation state of said other elements.

19. (New) A process for producing an unsaturated nitrile, which comprises subjecting an alkane, or a mixture of an alkane and an alkene, and ammonia to a vapor phase catalytic oxidation reaction in the presence of a catalyst produced by a process comprising:

a) vapor depositing one upon the other a plurality of thin films, each thin film containing at least one of the elements A, D, E and X to form a composite of A, D, E and X, wherein A is at least one element selected from the group consisting of Mo and W, D is at least one element selected from the group consisting of V and Ce, E is at least one element selected from the group consisting of Te, Sb and Se, and X is at least one element selected from the group consisting of Nb, Ta, Ti, Al, Zr, Cr, Mn, Fe, Ru, Co, Rh, Ni, Pt, Sb, Bi, B, In, As, Ge, Sn, Li, Na, K, Rb, Cs, Fr, Be, Mg, Ca, Sr, Ba, Ra, Hf, Ag, Pb, P, Pm, Eu, Gd, Dy, Ho, Er, Tm, Yb and Lu; and

b) calcining said plurality of thin films to form a catalyst comprising a mixed metal oxide having a base composition empirical formula $A_aD_bE_cX_dO_e$ wherein A, D, E and X are as previously defined, O is oxygen and, when $a = 1$, $b = 0.01$ to 1.0 , $c = 0.01$ to 1.0 , $d = 0.01$ to 1.0 , and e is dependent on the oxidation state of said other elements.